


AWARD/CONTRACT		1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700)		RATING		PAGE OF PAGES 1 2	
2. CONTRACT (Proc. Inst. Ident.) NO. EP-C-17-031/68HE0C18F0894				3. EFFECTIVE DATE See Block 20C		4. REQUISITION/PURCHASE REQUEST/PROJECT NO. PR-ORD-18-01798	
5. ISSUED BY CODE		CPOD		6. ADMINISTERED BY (If other than Item 5) CODE		CPOD	
CPOD US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: W136 Cincinnati OH 45268-0001				CPOD US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: NWD Cincinnati OH 45268		SCD-C	
7. NAME AND ADDRESS OF CONTRACTOR (No., street, country, State and ZIP Code) TETRA TECH, INC. Attn: George Townsend 10306 EATON PL STE 340 FAIRFAX VA 22030				8. DELIVERY <input type="checkbox"/> FOB ORIGIN <input checked="" type="checkbox"/> OTHER (See below)			
				9. DISCOUNT FOR PROMPT PAYMENT			
				10. SUBMIT INVOICES (4 copies unless otherwise specified) TO THE ADDRESS SHOWN IN		ITEM	
CODE 198549560		FACILITY CODE					
11. SHIP TO/MARK FOR CODE		ORD NCEA DC		12. PAYMENT WILL BE MADE BY CODE		RTP FMC	
ORD NCEA DC US Environmental Protection Agency ORD NCEA William Jefferson Clinton 1200 Pennsylvania Ave NW Mail Code 8623P Washington DC 20460				RTP Finance Center US Environmental Protection Agency RTP-Finance Center (D143-02) 109 TW Alexander Drive Durham NC 27711			
13. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION: <input type="checkbox"/> 10 U.S.C. 2304 (c) () <input checked="" type="checkbox"/> 41 U.S.C. 3304 (a) ()				14. ACCOUNTING AND APPROPRIATION DATA See Schedule			
15A. ITEM NO	15B. SUPPLIES/SERVICES			15C. QUANTITY	15D. UNIT	15E. UNIT PRICE	15F. AMOUNT
	Continued						
15G. TOTAL AMOUNT OF CONTRACT						\$69,977.00	
16. TABLE OF CONTENTS							
(X)	SEC.	DESCRIPTION	PAGE(S)	(X)	SEC.	DESCRIPTION	PAGE(S)
PART I - THE SCHEDULE				PART II - CONTRACT CLAUSES			
	A	SOLICITATION/CONTRACT FORM			I	CONTRACT CLAUSES	
	B	SUPPLIES OR SERVICES AND PRICES/COSTS		PART III - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACH.			
	C	DESCRIPTION/SPECS./WORK STATEMENT			J	LIST OF ATTACHMENTS	
	D	PACKAGING AND MARKING		PART IV - REPRESENTATIONS AND INSTRUCTIONS			
	E	INSPECTION AND ACCEPTANCE			K	REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS	
	F	DELIVERIES OR PERFORMANCE			L	INSTRS., CONDS., AND NOTICES TO OFFERORS	
	G	CONTRACT ADMINISTRATION DATA			M	EVALUATION FACTORS FOR AWARD	
	H	SPECIAL CONTRACT REQUIREMENTS					
CONTRACTING OFFICER WILL COMPLETE ITEM 17 (SEALED-BID OR NEGOTIATED PROCUREMENT) OR 18 (SEALED-BID PROCUREMENT) AS APPLICABLE							
17. <input checked="" type="checkbox"/> CONTRACTOR'S NEGOTIATED AGREEMENT (Contractor is required to sign this document and return _____ copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. (Attachments are listed herein.)				18. <input type="checkbox"/> SEALED-BID AWARD (Contractor is not required to sign this document.) Your bid on Solicitation Number _____, including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the items listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your bid, and (b) this award/contract. No further contractual document is necessary. (Block 18 should be checked only when awarding a sealed-bid contract.)			
19A. NAME AND TITLE OF SIGNER (Type or print)				20A. NAME OF CONTRACTING OFFICER Mark Cranley			
19B. NAME OF CONTRACTOR		19C. DATE SIGNED		20B. UNITED STATES OF AMERICA		20C. DATE SIGNED	
BY (Signature of person authorized to sign)				BY  (Signature of the Contracting Officer)		ELECTRONIC SIGNATURE 09/25/2018	

CONTINUATION SHEET	REFERENCE NO. OF DOCUMENT BEING CONTINUED EP-C-17-031/68HE0C18F0894	PAGE	OF
		2	2

NAME OF OFFEROR OR CONTRACTOR
TETRA TECH, INC.

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
0001	<p>DUNS Number: 198549560</p> <p>FFP TO ADAPTATION PLANNING FOR RESILIENT NATURAL RESOURCES</p> <p>Fully Funded at the time of award</p> <p>TOCOR: Jordan West Max Expire Date: 09/30/2019 Accounting Info: 18-19-C-262W000-000FK6XR1-2532-26A5C-18262WC809-002 BFY: 18 EFY: 19 Fund: C Budget Org: 262W000 Program (PRC): 000FK6XR1 Budget (BOC): 2532 Cost: 26A5C DCN - Line ID: 18262WC809-002 Period of Performance: 10/01/2018 to 09/30/2019</p>				
	<p>Task Order Issuance Line Item: Technical Support for EPA/ORD/NCEA's Ecological Assessment Programs</p> <p>Delivery-Invoice Payment Schedule shall not exceed a frequency greater than once a month and 90% of the task order price. Acceptance for invoicing is based on deliverable approval by the TOCOR. For efficient processing IAW FAR clause 52.232-32, performance based payment invoicing amounts will not be submitted until the TOCOR provides deliverable approval. The TOCOR will notify Tetra Tech within 14 days of submission of a deliverable of EPAs intention to approve or disapprove.</p> <p>TOCOR: Jordan West/703-347-8584/west.jordan@epa.gov ALTOCOR: Susan Julius/703-347-8619/julius.susan@epa.gov</p>				69,977.00

PERFORMANCE WORK STATEMENT

Contract: EP-C-17-031
PR-ORD-17-01798
TO 68HE0C18F0894

TITLE: Adaptation Planning for Resilient Natural Resources
EAS Short Title: Adaptation for Natural Resources

PERIOD OF PERFORMANCE: 1 October 2018 to 30 September 2019

TASK ORDER COR: Jordan West
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INTRODUCTION

Work in EPA's Exposure Analysis and Risk Characterization Group (EARCG) includes assessments of the potential vulnerability to climate change (and other global change stressors such as land-use change) of ecosystem health, water quality, human health and air quality with a focus on developing adaptation options to build resilience in the face of these vulnerabilities. We carry out interdisciplinary syntheses across newly emerging scientific findings to identify potential impacts and characterize and communicate the uncertainty in the science and to provide adaptation support for decision makers and managers. Vulnerability and adaptation assessment activities in the EARCG's aquatic ecosystems focus area support EPA's mission and responsibilities as defined by the Clean Water Act (CWA) and are designed to build the capacity of EPA programs, regional offices, aquatic ecosystem managers (including wetland and coral reef managers), and other decision-makers to assess and respond to global change impacts on ecosystem processes and services. The purpose of this task order is to provide technical support to the EARCG and partners to advance frameworks and methods for vulnerability assessments and adaptation planning processes for resilient wetland, coral reef, and other natural resource systems.

This task order (TO) focuses on two complementary areas of work: (1) vulnerability and adaptation assessment methods for wetlands and their applications for resilience-based management; and (2)

adaptation planning frameworks demonstrated for coral reefs and other aquatic systems. Each of these major areas of work is represented by a Task.

Work Area 1, **National Wetlands Vulnerability Assessment Methods**, supports EPA Office of Water's (OW) priority #4 (Watersheds at risk) and priority #5 (Coastal wetlands at risk). Earlier work in this area focused on: the development of a methodological framework and inventory of wetland vulnerabilities for a mid-Atlantic pilot region based on vulnerability assessment methods, resilience theory, and wetlands classifications; an analysis and summary of best approaches for applying inventory results to inform adaptation of EPA OW Programs; and initiation of follow-on work in the form of a Coastal Track (extending the framework and approach to coastal wetlands) and a Programmatic Track (applying the framework and results to decision-making with partners in State programs). An EPA report and two journal articles initiated under the Coastal Track and are underway in collaboration with stakeholders from the Partnership for the Delaware Estuary (PDE).

Work Area 2, **Adaptation Planning Framework & Coral Reef Demonstration**, supports EPA OW'S priority #8 (Indicators of climate change), as well as needs of EPA Regions with coral reefs and other applicable aquatic systems (such as those supported by the Chesapeake Bay Program). Earlier work in this area focused on: collaboration with a Climate-Smart Work Group convened by the National Wildlife Federation to develop a unified adaptation framework for natural resources; demonstration of a more detailed and tailored use of the framework for coral reef ecosystems to assist practitioner-managers in the field; and development of an "Adaptation Design Tool" that helps scientists and managers brainstorm and design effective adaptation actions in response to identified vulnerabilities to the resilience of their natural resources due to environmental change. Collaborations are underway with The Nature Conservancy (TNC) and the National Oceanic and Atmospheric Administration (NOAA) to advance the use of the Adaptation Design Tool across U.S. coral reef jurisdictions.

OBJECTIVES

For **Work Area 1**, the Contractor shall continue—following on work under the previous Task Order (0001) of this contract—technical advancement of frameworks and methods for characterizing wetland relative vulnerabilities for multiple wetland types at multiple scales, to support development of information and processes for integrating climate change considerations into wetlands programs and activities of OW as well as Regional and State partners. Objectives are to:

- (1) Finalize and publish journal article #1, *Framework for assessing wetland vulnerabilities to sea level rise in order to inform management: Delaware Bay case study, Part I*. This covers the technical approach for extending framework concepts to coastal wetlands using previously-generated SLAMM (Sea Level Affecting Marshes Model) projections, followed by application of the results to examine implications for wetlands restoration and management.
- (2) Develop and publish journal article #2, *Integrating storm surge and marsh condition along with sea level rise into coastal wetland vulnerability assessments: Delaware Bay case study, Part II*. This covers the technical approach for inclusion of projected storm surge impacts and condition assessment data when using the relative vulnerabilities framework, to better understand, characterize and communicate both vulnerabilities and potential management responses.

For **Work Area 2**, the Contractor shall provide technical support-- following on work under the previous Task Order (0001) of this contract --for continued elaboration of the climate-smart adaptation planning cycle, with development of associated adaptation design and evaluation methods. Objectives are to:

- (1) Work with outside partners to develop collaborations to demonstrate, ground-truth and promulgate adaptation design and evaluation methods with practitioners in the field engaged in resilience-based management.
- (2) Develop and publish a journal article on lessons learned and synthetic principles that emerge from comparing and contrasting frameworks and methods under Work Area 1 and Work Area 2, in terms of their convergence on questions of how to move smoothly from vulnerability assessment, to adaptation design, to adaptation assessment (evaluation and selection of best practices), to implementation; also included will be a feasibility analysis of the potential value of pursuing a larger-scale synthesis of diverse adaptation projects across ORD and beyond, to identify universal themes, common challenges, unique perspectives, and the potential for a unifying framework or consistent step-wise thought process applicable to all systems and decision contexts.

REQUIRED CONTRACTOR QUALIFICATIONS

- 1) Multidisciplinary professional expertise in assessing the impacts of climate change and other interacting stressors (such as land use change) on climate-sensitive ecosystems, including expertise in resilience and threshold theory and management adaptation.
 - 2) Thorough knowledge and application of wetlands classification systems including the hydro-geomorphic method (HGM) and Cowardin/National Wetlands Inventory (NWI) system; thorough knowledge of the CWA Section 404 compensatory mitigation program; and familiarity with State voluntary restoration activities in EPA Region 3.
 - 3) Thorough knowledge of conceptual approaches, methods, trainings and on-the-ground work on climate change vulnerability assessment and adaptation planning applications for coral reef, wetland, and watershed conservation and management.
 - 4) Experience developing and evaluating practical frameworks and trainings for integrating climate change considerations into management planning and building resilience into conservation.
 - 5) Expertise in directed literature searches and synthetic analyses of available literature (including grey literature). Expertise in conducting literature reviews and compiling, interpreting and using pertinent models, data sets and reports for wetlands associated with Coastal Track and Programmatic Track case study locations.
 - 6) Experience organizing and facilitating stakeholder processes, partnerships, and expert scientific meetings.
 - 7) Experience developing, managing, and ensuring quality control of large-scale datasets and assessments.
 - 8) Experience preparing technical reports and papers written in clear, concise prose consistent with the standards of peer reviewed scientific literature.
-

SPECIFIC TASKS:

TASK 1 Prepare Quality Assurance Project Plan and Establish/Maintain Communication

SubTask 1.1: Develop a Quality Assurance Project Plan

For previous work under TO 0001 of this contract, the Contractor has been working under Quality Assurance Project Plan (QAPP) #494, which documents the quality processes and procedures for the types of tasks associated with this project. The Contractor shall create an updated QAPP for this Task Order, adding any new information as necessary to reflect the Tasks below, and shall submit the QAPP for TOCOR and QA Manager's approval. The Contractor shall not perform any work on the new tasks under this task order until the QAPP is reviewed and approved by the TOCOR and QA Manager. The QAPP shall include documentation on quality assurance checks to verify accuracy, completeness, and adherence to established format and must address data collection, analysis, and the use of existing (secondary) data that will be used in this project. Guidance for developing QAPPs that meet EPA specifications prepared for activities conducted by or funded by EPA, are available online at http://www.epa.gov/quality/qa_docs.html, see "EPA Requirements for Quality Assurance Project Plans (QA/R-5)". EPA ORD has a new requirement and new tracking system. The contractor shall include the following EPA ORD QA Tracking number on the QAPP cover page: X-XX-XXXXXXX-XX-X-X.

Deliverable 1.1a: QAPP

Due: within 7 days of task order award

The Contractor shall not proceed with Tasks 2 - 3 until the QAPP is approved.

SubTask 1.2: Establish and Maintain Communication

Within seven days after QAPP approval, the Contractor shall schedule a kickoff call, not to exceed 2 hours, with the TOCOR and appropriate Contractor staff to clarify outstanding questions and confirm the schedule and specific tasks. The Contractor shall establish a schedule for regular progress reports, check in calls, and other communications throughout the period of performance. The Contractor shall initiate additional communication with the TOCOR should developments arise that may affect the conduct or schedule of any task. The Contractor shall prepare very brief minutes of meetings with the EPA staff and monthly status reports. The EPA will review the minutes to ensure that an accurate record of the communications has been made and filed.

Deliverable 1.2a: Kickoff call

Due: within 7 days of QAPP approval

Deliverable 1.2b: Regular status reports

Due: monthly

TASK 2 National Wetlands Vulnerability Assessment Methods

SubTask 2.1: Journal article #1, Delaware Bay case study, Part I

Under a previous TO (0001) of this contract, EPA and the Contractor collaborated with the Partnership for the Delaware Estuary (PDE) on a case study that uses a modified coastal wetlands vulnerability

framework to assess the relative vulnerabilities of salt marshes of the Delaware Estuary in order to inform adaptation of PDE programs. The Contractor shall continue working from the existing vulnerability assessment and adaptation analysis for the specific case study application. The TOCOR will provide a draft journal article that has already been developed on this case study, along with internal review comments, as the starting point for this SubTask.

In this SubTask, the Contractor shall work with the TOCOR to finalize and submit the abovementioned journal article, *Framework for assessing wetland vulnerabilities to sea level rise in order to inform management: Delaware Bay case study, Part I*. This presents the technical approach for application of framework concepts to coastal wetlands in the Delaware Estuary—including discussion of approaches for both data-rich and data-scarce situations—and the framework’s applicability at the national scale. The journal article will examine a subset of this information as it relates to selected management targets and development of recommendations for management adaptations within PDE wetlands conservation and restoration programs. Based on the results of EPA internal review and clearance of the internal review draft (IRD), the Contractor shall produce and submit an external review draft (ERD) for journal review, followed by revision and final submission of the finished product for publication based on external review comments. All product versions will be written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

Deliverable 2.1a: External Review Draft (ERD) and submission **Due:** Concurrent with submission of article #2 (see below)

The Contractor shall use the materials provided by the TOCOR (draft journal article with EPA internal review comments) to prepare an ERD journal article in consultation with the TOCOR. The article will then be formatted and submitted to a journal selected in collaboration with the TOCOR and full project team. The goal will be to submit article #1 and article #2 to the same journal as a pair (Part I and Part II); therefore, the submission date for this ERD will be determined by readiness to submit article #2.

Deliverable 2.1b: Revisions and final submission **Due:** ~4 weeks after receipt of external review comments (paired with article #2)

Working with feedback received from the external reviewers, the Contractor shall work with the TOCOR to revise the journal article and proceed with final submission for publication. Since the goal will be to publish article #1 and article #2 in the same journal simultaneously, the timeline for final submission may need to be adjusted based on timing of receipt of reviews of both articles, and as per instruction from the TOCOR.

SubTask 2.2: Journal article #2, Delaware Bay case study, Part II

Under a previous TO (0001) of this contract, EPA and the Contractor began discussions and an outline for a follow-on journal article to article #1 above. The Contractor shall continue working from this draft outline to develop and submit a second article for publication. The TOCOR will provide the annotated draft outline, along with comments, as a starting point for this journal article.

Therefore, in this SubTask the Contractor shall work with the TOCOR to develop, submit for internal review, revise, submit for journal review, and make final revisions for publication of the journal article, *Integrating storm surge and marsh condition along with sea level rise into coastal wetland vulnerability*

assessments: Delaware Bay case study, Part II. This article will present the technical approach for inclusion of projected storm surge impacts and condition assessment data in combination with outputs of the relative vulnerabilities framework (presented in journal article #1; this complementary information, examined in conjunction with framework results, will be used to better understand, characterize and communicate both vulnerabilities and potential management responses for the PDE case study wetlands. An internal review draft will first be developed, and based on results of the EPA internal review and clearance process, the Contractor shall produce and submit an external review draft (ERD) for journal review, followed by revision and final submission of the finished product for publication based on external review comments. All product versions will be written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

Deliverable 2.2a: Internal Review Draft (IRD)

Due: 12 weeks after QAPP approval

The Contractor shall use the annotated outline provided by the TOCOR as the starting point for working with the TOCOR to develop the first draft journal article. This should include first finalizing the outline—based on TOCOR comments as well as team review of the finalized content of article #1—to clarify article #2’s scope, substance and continuity with article #1.

Deliverable 2.2b: External Review Draft (ERD) and submission

Due: 4 weeks after receipt of IRD comments (paired submission with article #1)

The Contractor shall use TOCOR and EPA internal review comments to inform preparation of an ERD of the journal article in consultation with the TOCOR. The article will then be formatted and submitted to a journal selected in collaboration with the TOCOR and full project team. The goal will be to submit article #2 along with article #1 to the same journal as a pair (Part I and Part II); therefore, the submission date for both articles will be determined by readiness to submit article #2.

Deliverable 2.2c: Revisions and final submission

Due: ~4 weeks after receipt of external review comments (paired submission with article #1)

Working with feedback received from the external reviewers, the Contractor shall work with the TOCOR to revise the journal article and proceed with final submission for publication. Since the goal will be to publish article #1 and article #2 in the same journal simultaneously, the timeline for final submission may need to be adjusted based on timing of receipt of reviews of both articles, and as per instruction from the TOCOR.

TASK 3 Adaptation Planning Framework & Coral Reef Demonstration

SubTask 3.1: Adaptation science collaborations

In this SubTask, the Contractor shall work with the TOCOR to build collaborative partnerships to demonstrate, ground-truth and promulgate adaptation design and evaluation methods with practitioners in the field engaged in resilience-based management. This may include, but is not limited to, technical advice and support for: use of the Adaptation Design Tool developed in the previous TO

(0001); development of projects to further advance methods for moving from design, to evaluation and selection of priority actions, to development of tools, worksheets and methods to assist practitioners in applying adaptation design principles. It shall also involve travel by Contractor staff to two in-person working meetings to develop collaborative processes and technical outputs.

Deliverable 3.1a: Monthly calls

Due: As needed, TBD with TOCOR

The Contractor shall participate in brainstorming calls with partners approximately monthly as needed, as determined in consultation with the TOCOR.

Deliverable 3.1b: In-person working meetings

Due: TBD with TOCOR

Contractor staff shall attend two in-person meetings of two days each, to work with EPA project team members and external partners in the Washington, DC area. Travel and lodging arrangements shall be consistent with U.S. government travel, lodging, and per diem allowances. The Contractor shall budget for two staff members familiar with the wetlands and climate-smart adaptation framework areas of work to attend one of the meetings, and one staff member familiar with the coral reef/adaptation design tool work to attend the other meeting. The Contractor shall assist the TOCOR in producing an agenda and presentation for each meeting, shall then travel to and attend at the meetings, and shall submit meeting notes after the meetings.

SubTask 3.2: Synthetic principles and lessons learned

In this SubTask, the Contractor shall work with the TOCOR to develop and publish a journal article on lessons learned and synthetic principles that emerge from comparing and contrasting frameworks and methods under Work Area 1 and Work Area 2. An initial assessment will be made of the work areas' convergence on questions of how to move smoothly from vulnerability assessment, to adaptation design, to adaptation assessment (evaluation and selection of best practices), to implementation; the topics developed will be used as the basis for scoping and developing a journal article. As the journal article progresses, there will be a concomitant exercise to assess the feasibility and potential value of pursuing a larger-scale synthesis of diverse adaptation projects across ORD and beyond, to identify universal themes, common challenges, unique perspectives, and the potential for a unifying framework or consistent step-wise thought process applicable to all systems and decision contexts.

Deliverable 3.2a: Memo #1: Compare & contrast Work Areas 1 & 2

Due: 8 weeks after QAPP approval

Using the climate-smart adaptation cycle developed under the previous TO (0001) of this contract as a starting point, the Contractor shall prepare a memo of 4-8 pages that assesses progress across Work Areas 1 and 2. The memo shall compare-and-contrast the approaches, effectiveness, challenges, insights, conclusions and aspects unique to ecosystem-type under Work Area 1 and Work Area 2. Insofar as efforts under each Work Area have applied to various steps of adaptation planning, with the shared goal of informing practical management decisions on the ground, the memo will address where the approaches may have converged on conceptual grounds, and/or where they remain incongruent, and why.

Deliverable 3.2b: Annotated outline for journal article

Due: 4 weeks after 3.2a approval

The Contractor shall use Memo #1 and comments received from the TOCOR as the basis to develop an annotated outline for a journal article. The outline should lay out the scope and major components of the paper, and the annotations should describe the main contents, including draft take-home messages.

Deliverable 3.2c: IRD journal article

Due: 8 weeks after 3.2b approval

The Contractor shall use the annotated outline of 3.2b as the starting point for working with the TOCOR to develop the first draft journal article.

Deliverable 3.2d: Memo #2: Feasibility of a larger-scale synthesis

Due: 4 weeks after 3.2c approval

While the IRD journal article is undergoing internal review, the Contractor shall build on the ideas emerging from the journal article, to produce a second memo of 4-8 pages. This memo will assess the feasibility and value of engaging in a subsequent, larger-scale synthesis drawing from a greater number and variety of vulnerability and adaptation assessment efforts both within and outside of EPA. Using just a few example projects from the broader EPA EARCG group as a starting point, the memo will speculate on the potential for being able to identify universal themes, common challenges, unique perspectives, and a consistent step-wise thought process for adaptation planning, which would be applicable to all systems and decision contexts. This memo is intended to form the basis for a proposal for future work, thus should touch upon options for smaller-scope versus larger-scope versions.

Deliverable 3.2e: ERD and submission of journal article

Due: 4 weeks after receipt of IRD comments

The Contractor shall use TOCOR and EPA internal review comments to inform preparation of an ERD of the journal article in consultation with the TOCOR. The article will then be formatted and submitted to a journal selected in collaboration with the TOCOR and full project team.

Deliverable 3.2f: Revisions and final submission of journal article

Due: 4 weeks after receipt of external reviews

Working with feedback received from the external reviewers, the Contractor shall work with the TOCOR to revise the journal article and proceed with final submission for publication.

MILESTONES AND DELIVERABLES:

Task/ SubTask	Milestone/Deliverable	Due Date
1	Prepare Quality Assurance Project Plan and Establish/Maintain Communication	

1.1	Quality Assurance Project Plan	
	1.1a: Update Quality Assurance Project Plan	7 days after TO award
1.2	Communications	
	1.2a: Kickoff call and regular communications	7 days after QAPP approval
	1.2b: Progress reports	Monthly
2	National Wetlands Vulnerability Assessment Methods	
2.1	Journal article #1, Delaware Bay case study, Part I	
	2.1a: External Review Draft (ERD) and submission	Concurrent with submission of article #2 (see below)
	2.1b: Revisions and final submission	~4 weeks after receipt of external reviews (paired submission with article #2)
2.2	Journal article #2, Delaware Bay case study, Part II	
	2.2a: Internal Review Draft (IRD)	12 weeks after QAPP approval
	2.2b: ERD and submission	4 weeks after receipt of IRD comments (paired submission with article #1)
	2.2c: Revisions and final submission	~4 weeks after receipt of external reviews (paired submission with article #1)
3	Adaptation Planning Framework & Demonstrations	
3.1	Adaptation science collaborations	
	3.1a: Monthly calls	As needed, TBD with TOCOR
	3.1b: In-person working meetings	TBD with TOCOR
3.2	Synthetic principles and lessons learned	
	3.2a: Memo #1: Compare & contrast Work Areas 1 & 2	8 weeks after QAPP approval
	3.2b: Annotated outline for journal article	4 weeks after 3.2a approval
	3.2c: IRD journal article	8 weeks after 3.2b approval
	3.2d: Memo #2: Feasibility of a larger-scale synthesis	4 weeks after 3.2c approval
	3.2e: ERD and submission of journal article	4 weeks after receipt of IRD comments
	3.2f: Revisions and final submission of journal article	4 weeks after receipt of external reviews

ACCEPTANCE CRITERIA:

The Contractor shall prepare high quality deliverables in accordance with academic standards. Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high

quality similar to presentations developed for national scientific forums and should be formatted as jpeg or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format.

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE		PAGE OF PAGES	
						1 2	
2. AMENDMENT/MODIFICATION NO.		3. EFFECTIVE DATE		4. REQUISITION/PURCHASE REQ. NO.		5. PROJECT NO. (If applicable)	
P00001		See Block 16C		PR-ORD-19-01182			
6. ISSUED BY		CODE		7. ADMINISTERED BY (If other than Item 6)		CODE	
CAD							
US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: W136 Cincinnati OH 45268-0001							
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)				(x)			
TETRA TECH, INC. Attn: George Townsend 10306 EATON PL STE 340 FAIRFAX VA 22030				9A. AMENDMENT OF SOLICITATION NO.			
				9B. DATED (SEE ITEM 11)			
				x			
				10A. MODIFICATION OF CONTRACT/ORDER NO.			
				EP-C-17-031			
				68HE0C18F0894			
				10B. DATED (SEE ITEM 13)			
				09/25/2018			
CODE 198549560		FACILITY CODE					
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS							
<input type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers <input type="checkbox"/> is extended. <input type="checkbox"/> is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or electronic communication which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by letter or electronic communication, provided each letter or electronic communication makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.							
12. ACCOUNTING AND APPROPRIATION DATA (If required)							
See Schedule							
13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.							
CHECK ONE	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.						
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation data, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).						
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:						
	D. OTHER (Specify type of modification and authority)						
X	BILATERAL AGREEMENT - NO COST NO POP EXTENSION PWS AMENDMENT						
E. IMPORTANT: Contractor <input type="checkbox"/> is not <input checked="" type="checkbox"/> is required to sign this document and return <u>1</u> copies to the issuing office.							
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)							
DUNS Number: 198549560							
TOCOR: Jordan West Max Expire Date: 09/30/2019							
LIST OF CHANGES:							
Reason for Modification: Other Administrative Action - NO COST NO POP EXTENSION PWS AMENDMENT (SEE ATTACHED): CONSOLIDATION OF SUBTASK 3 DELIVERABLES.							
Period of Performance: 10/01/2018 to 09/30/2019							
Delivery-Invoice Payment Schedule shall not exceed a frequency greater than once a month and 90% of the task order price. Acceptance for invoicing is based on deliverable approval by the TOCOR. For efficient processing IAW FAR clause 52.232-32, performance based payment Continued ...							
Except as provided herein, all terms and conditions of the document referenced in Item 9 A or 10A, as heretofore changed, remains unchanged and in full force and effect.							
15A. NAME AND TITLE OF SIGNER (Type or print)				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)			
				Andrea Dehne			
15B. CONTRACTOR/OFFEROR		15C. DATE SIGNED		16B. UNITED STATES OF AMERICA		16C. DATE SIGNED	
				 (Signature of Contracting Officer)		06/03/2019 ELECTRONIC SIGNATURE	
(Signature of person authorized to sign)							

CONTINUATION SHEET	REFERENCE NO. OF DOCUMENT BEING CONTINUED	PAGE	OF
	EP-C-17-031/68HE0C18F0894/P00001	2	2

NAME OF OFFEROR OR CONTRACTOR
TETRA TECH, INC.

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	invoicing amounts will not be submitted until the TOCOR provides deliverable approval. The TOCOR will notify Tetra Tech within 14 days of submission of a deliverable of EPAs intention to approve or disapprove. TOCOR: Jordan West/703-347-8584/west.jordan@epa.gov ALTOCOR: Susan Julius/703-347-8619/julius.susan@epa.gov				

PERFORMANCE WORK STATEMENT

Amendment 1

Contract: EP-C-17-031
PR-ORD-~~18-01798~~19-01182
TO 18F0894

TITLE: Adaptation Planning for Resilient Natural Resources

EAS Short Title: Adaptation for Natural Resources

PERIOD OF PERFORMANCE: TO Award date through one year following award

TASK ORDER COR: Jordan West
Global Change Research Program
US Environmental Protection Agency
1200 Pennsylvania Ave., NW (8601P)
Washington, DC 20460
west.jordan@epa.gov
703-347-8584 (voice)
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ALTERNATE TOCOR: Susan Julius
Global Change Research Program
US Environmental Protection Agency
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INTRODUCTION

Work in EPA's Exposure Analysis and Risk Characterization Group (EARCG) includes assessments of the potential vulnerability to climate change (and other global change stressors such as land-use change) of ecosystem health, water quality, human health and air quality with a focus on developing adaptation options to build resilience in the face of these vulnerabilities. We carry out interdisciplinary syntheses across newly emerging scientific findings to identify potential impacts and characterize and communicate the uncertainty in the science and to provide adaptation support for decision makers and managers. Vulnerability and adaptation assessment activities in the EARCG's aquatic ecosystems focus area support EPA's mission and responsibilities as defined by the Clean Water Act (CWA) and are designed to build the capacity of EPA programs, regional offices, aquatic ecosystem managers (including wetland and coral reef managers), and other decision-makers to assess and respond to global change impacts on ecosystem processes and services. The purpose of this task order is to provide technical support to the EARCG and partners to advance frameworks and methods for vulnerability assessments and adaptation planning processes for resilient wetland, coral reef, and other natural resource systems.

This task order (TO) focuses on two complementary areas of work: (1) vulnerability and adaptation assessment methods for wetlands and their applications for resilience-based management; and (2) adaptation planning frameworks demonstrated for coral reefs and other aquatic systems. Each of these major areas of work is represented by a Task.

Work Area 1, **National Wetlands Vulnerability Assessment Methods**, supports EPA Office of Water's (OW) priority #4 (Watersheds at risk) and priority #5 (Coastal wetlands at risk). Earlier work in this area focused on: the development of a methodological framework and inventory of wetland vulnerabilities for a mid-Atlantic pilot region based on vulnerability assessment methods, resilience theory, and wetlands classifications; an analysis and summary of best approaches for applying inventory results to inform adaptation of EPA OW Programs; and initiation of follow-on work in the form of a Coastal Track (extending the framework and approach to coastal wetlands) and a Programmatic Track (applying the framework and results to decision-making with partners in State programs). An EPA report and two journal articles initiated under the Coastal Track and are underway in collaboration with stakeholders from the Partnership for the Delaware Estuary (PDE).

Work Area 2, **Adaptation Planning Framework & Coral Reef Demonstration**, supports EPA OW'S priority #8 (Indicators of climate change), as well as needs of EPA Regions with coral reefs and other applicable aquatic systems (such as those supported by the Chesapeake Bay Program). Earlier work in this area focused on: collaboration with a Climate-Smart Work Group convened by the National Wildlife Federation to develop a unified adaptation framework for natural resources; demonstration of a more detailed and tailored use of the framework for coral reef ecosystems to assist practitioner-managers in the field; and development of an "Adaptation Design Tool" that helps scientists and managers brainstorm and design effective adaptation actions in response to identified vulnerabilities to the resilience of their natural resources due to environmental change. Collaborations are underway with The Nature Conservancy (TNC) and the National Oceanic and Atmospheric Administration (NOAA) to advance the use of the Adaptation Design Tool across U.S. coral reef jurisdictions.

OBJECTIVES

For **Work Area 1**, the Contractor shall continue—following on work under the previous Task Order (0001) of this contract—technical advancement of frameworks and methods for characterizing wetland relative vulnerabilities for multiple wetland types at multiple scales, to support development of information and processes for integrating climate change considerations into wetlands programs and activities of OW as well as Regional and State partners. Objectives are to:

- (1) Finalize and publish journal article #1, *Framework for assessing wetland vulnerabilities to sea level rise in order to inform management: Delaware Bay case study, Part I*. This covers the technical approach for extending framework concepts to coastal wetlands using previously-generated SLAMM (Sea Level Affecting Marshes Model) projections, followed by application of the results to examine implications for wetlands restoration and management.
- (2) Develop and publish journal article #2, *Integrating storm surge and marsh condition along with sea level rise into coastal wetland vulnerability assessments: Delaware Bay case study, Part II*. This covers the technical approach for inclusion of projected storm surge impacts and condition assessment data when using the relative vulnerabilities framework, to better understand, characterize and communicate both vulnerabilities and potential management responses.

For **Work Area 2**, the Contractor shall provide technical support-- following on work under the previous Task Order (0001) of this contract --for continued elaboration of the climate-smart adaptation planning

cycle, with development of associated adaptation design and evaluation methods. Objectives are to:

- (1) Work with outside partners to develop collaborations to demonstrate, ground-truth and promulgate adaptation design and evaluation methods with practitioners in the field engaged in resilience-based management.
- (2) Develop and publish a journal article on lessons learned and synthetic principles that emerge from comparing and contrasting frameworks and methods under Work Area 1 and Work Area 2, in terms of their convergence on questions of how to move smoothly from vulnerability assessment, to adaptation design, to adaptation assessment (evaluation and selection of best practices), to implementation; also included will be a feasibility analysis of the potential value of pursuing a larger-scale synthesis of diverse adaptation projects across ORD and beyond, to identify universal themes, common challenges, unique perspectives, and the potential for a unifying framework or consistent step-wise thought process applicable to all systems and decision contexts.

REQUIRED CONTRACTOR QUALIFICATIONS

- 1) Multidisciplinary professional expertise in assessing the impacts of climate change and other interacting stressors (such as land use change) on climate-sensitive ecosystems, including expertise in resilience and threshold theory and management adaptation.
- 2) Thorough knowledge and application of wetlands classification systems including the hydro-geomorphic method (HGM) and Cowardin/National Wetlands Inventory (NWI) system; thorough knowledge of the CWA Section 404 compensatory mitigation program; and familiarity with State voluntary restoration activities in EPA Region 3.
- 3) Thorough knowledge of conceptual approaches, methods, trainings and on-the-ground work on climate change vulnerability assessment and adaptation planning applications for coral reef, wetland, and watershed conservation and management.
- 4) Experience developing and evaluating practical frameworks and trainings for integrating climate change considerations into management planning and building resilience into conservation.
- 5) Expertise in directed literature searches and synthetic analyses of available literature (including grey literature). Expertise in conducting literature reviews and compiling, interpreting and using pertinent models, data sets and reports for wetlands associated with Coastal Track and Programmatic Track case study locations.
- 6) Experience organizing and facilitating stakeholder processes, partnerships, and expert scientific meetings.
- 7) Experience developing, managing, and ensuring quality control of large-scale datasets and assessments.
- 8) Experience preparing technical reports and papers written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

SPECIFIC TASKS:

TASK 1 Prepare Quality Assurance Project Plan and Establish/Maintain Communication

SubTask 1.1: Develop a Quality Assurance Project Plan

For previous work under TO 0001 of this contract, the Contractor has been working under Quality Assurance Project Plan (QAPP) #494, which documents the quality processes and procedures for the types of tasks associated with this project. The Contractor shall create an updated QAPP for this Task Order, adding any new information as necessary to reflect the Tasks below, and shall submit the QAPP for TOCOR and QA Manager's approval. The Contractor shall not perform any work on the new tasks under this task order until the QAPP is reviewed and approved by the TOCOR and QA Manager. The QAPP shall include documentation on quality assurance checks to verify accuracy, completeness, and adherence to established format and must address data collection, analysis, and the use of existing (secondary) data that will be used in this project. Guidance for developing QAPPs that meet EPA specifications prepared for activities conducted by or funded by EPA, are available online at http://www.epa.gov/quality/qa_docs.html, see "EPA Requirements for Quality Assurance Project Plans (QA/R-5)". EPA ORD has a new requirement and new tracking system. The contractor shall include the following EPA ORD QA Tracking number on the QAPP cover page: X-XX-XXXXXXX-XX-X-X.

Deliverable 1.1a: QAPP

Due: within 7 days of task order award

The Contractor shall not proceed with Tasks 2 - 3 until the QAPP is approved.

SubTask 1.2: Establish and Maintain Communication

Within seven days after QAPP approval, the Contractor shall schedule a kickoff call, not to exceed 2 hours, with the TOCOR and appropriate Contractor staff to clarify outstanding questions and confirm the schedule and specific tasks. The Contractor shall establish a schedule for regular progress reports, check in calls, and other communications throughout the period of performance. The Contractor shall initiate additional communication with the TOCOR should developments arise that may affect the conduct or schedule of any task. The Contractor shall prepare very brief minutes of meetings with the EPA staff and monthly status reports. The EPA will review the minutes to ensure that an accurate record of the communications has been made and filed.

Deliverable 1.2a: Kickoff call

Due: within 7 days of QAPP approval

Deliverable 1.2b: Regular status reports

Due: monthly

TASK 2 National Wetlands Vulnerability Assessment Methods

SubTask 2.1: Journal article #1, Delaware Bay case study, Part I

Under a previous TO (0001) of this contract, EPA and the Contractor collaborated with the Partnership

for the Delaware Estuary (PDE) on a case study that uses a modified coastal wetlands vulnerability framework to assess the relative vulnerabilities of salt marshes of the Delaware Estuary in order to inform adaptation of PDE programs. The Contractor shall continue working from the existing vulnerability assessment and adaptation analysis for the specific case study application. The TOCOR will provide a draft journal article that has already been developed on this case study, along with internal review comments, as the starting point for this SubTask.

In this SubTask, the Contractor shall work with the TOCOR to finalize and submit the abovementioned journal article, *Framework for assessing wetland vulnerabilities to sea level rise in order to inform management: Delaware Bay case study, Part I*. This presents the technical approach for application of framework concepts to coastal wetlands in the Delaware Estuary—including discussion of approaches for both data-rich and data-scarce situations—and the framework’s applicability at the national scale. The journal article will examine a subset of this information as it relates to selected management targets and development of recommendations for management adaptations within PDE wetlands conservation and restoration programs. Based on the results of EPA internal review and clearance of the internal review draft (IRD), the Contractor shall produce and submit an external review draft (ERD) for journal review, followed by revision and final submission of the finished product for publication based on external review comments. All product versions will be written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

Deliverable 2.1a: External Review Draft (ERD) and submission **Due:** Concurrent with submission of article #2 (see below)

The Contractor shall use the materials provided by the TOCOR (draft journal article with EPA internal review comments) to prepare an ERD journal article in consultation with the TOCOR. The article will then be formatted and submitted to a journal selected in collaboration with the TOCOR and full project team. The goal will be to submit article #1 and article #2 to the same journal as a pair (Part I and Part II); therefore, the submission date for this ERD will be determined by readiness to submit article #2.

Deliverable 2.1b: Revisions and final submission **Due:** ~4 weeks after receipt of external review comments (paired with article #2)

Working with feedback received from the external reviewers, the Contractor shall work with the TOCOR to revise the journal article and proceed with final submission for publication. Since the goal will be to publish article #1 and article #2 in the same journal simultaneously, the timeline for final submission may need to be adjusted based on timing of receipt of reviews of both articles, and as per instruction from the TOCOR.

SubTask 2.2: Journal article #2, Delaware Bay case study, Part II

Under a previous TO (0001) of this contract, EPA and the Contractor began discussions and an outline for a follow-on journal article to article #1 above. The Contractor shall continue working from this draft outline to develop and submit a second article for publication. The TOCOR will provide the annotated draft outline, along with comments, as a starting point for this journal article.

Therefore, in this SubTask the Contractor shall work with the TOCOR to develop, submit for internal review, revise, submit for journal review, and make final revisions for publication of the journal article,

Integrating storm surge and marsh condition along with sea level rise into coastal wetland vulnerability assessments: Delaware Bay case study, Part II. This article will present the technical approach for inclusion of projected storm surge impacts and condition assessment data in combination with outputs of the relative vulnerabilities framework (presented in journal article #1; this complementary information, examined in conjunction with framework results, will be used to better understand, characterize and communicate both vulnerabilities and potential management responses for the PDE case study wetlands. An internal review draft will first be developed, and based on results of the EPA internal review and clearance process, the Contractor shall produce and submit an external review draft (ERD) for journal review, followed by revision and final submission of the finished product for publication based on external review comments. All product versions will be written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

Deliverable 2.2a: Internal Review Draft (IRD)

Due: 12 weeks after QAPP approval

The Contractor shall use the annotated outline provided by the TOCOR as the starting point for working with the TOCOR to develop the first draft journal article. This should include first finalizing the outline—based on TOCOR comments as well as team review of the finalized content of article #1—to clarify article #2’s scope, substance and continuity with article #1.

Deliverable 2.2b: External Review Draft (ERD) and submission

Due: 4 weeks after receipt of IRD comments (paired submission with article #1)

The Contractor shall use TOCOR and EPA internal review comments to inform preparation of an ERD of the journal article in consultation with the TOCOR. The article will then be formatted and submitted to a journal selected in collaboration with the TOCOR and full project team. The goal will be to submit article #2 along with article #1 to the same journal as a pair (Part I and Part II); therefore, the submission date for both articles will be determined by readiness to submit article #2.

Deliverable 2.2c: Revisions and final submission

Due: ~4 weeks after receipt of external review comments (paired submission with article #1)

Working with feedback received from the external reviewers, the Contractor shall work with the TOCOR to revise the journal article and proceed with final submission for publication. Since the goal will be to publish article #1 and article #2 in the same journal simultaneously, the timeline for final submission may need to be adjusted based on timing of receipt of reviews of both articles, and as per instruction from the TOCOR.

TASK 3 Adaptation Planning Framework & Coral Reef Demonstration

SubTask 3.1: Adaptation science collaborations

In this SubTask, the Contractor shall work with the TOCOR to build collaborative partnerships to demonstrate, ground-truth and promulgate adaptation design and evaluation methods with practitioners in the field engaged in resilience-based management. This may include, but is not limited

to, technical advice and support for: use of the Adaptation Design Tool developed in the previous TO (0001); development of projects to further advance methods for moving from design, to evaluation and selection of priority actions, to development of tools, worksheets and methods to assist practitioners in applying adaptation design principles. It shall also involve travel by Contractor staff to two in-person working meetings to develop collaborative processes and technical outputs.

Deliverable 3.1a: Monthly calls

Due: As needed, TBD with TOCOR

The Contractor shall participate in brainstorming calls with partners approximately monthly as needed, as determined in consultation with the TOCOR.

Deliverable 3.1b: In-person working meetings

Due: TBD with TOCOR

Contractor staff shall attend two in-person meetings of two days each, to work with EPA project team members and external partners in the Washington, DC area. Travel and lodging arrangements shall be consistent with U.S. government travel, lodging, and per diem allowances. The Contractor shall budget for two staff members familiar with the wetlands and climate-smart adaptation framework areas of work to attend one of the meetings, and one staff member familiar with the coral reef/adaptation design tool work to attend the other meeting. The Contractor shall assist the TOCOR in producing an agenda and presentation for each meeting, shall then travel to and attend at the meetings, and shall submit meeting notes after the meetings.

SubTask 3.2: Synthetic principles and lessons learned

In this SubTask, the Contractor shall work with the TOCOR to develop and publish a journal article on lessons learned and synthetic principles that emerge from comparing and contrasting frameworks and methods under Work Area 1 and Work Area 2. An initial assessment will be made of the work areas' convergence on questions of how to move smoothly from vulnerability assessment, to adaptation design, to adaptation assessment (evaluation and selection of best practices), to implementation; the topics developed will be used as the basis for scoping and developing a journal article. As the journal article progresses, there will be a concomitant exercise to assess the feasibility and potential value of pursuing a larger-scale synthesis of diverse adaptation projects across ORD and beyond, to identify universal themes, common challenges, unique perspectives, and the potential for a unifying framework or consistent step-wise thought process applicable to all systems and decision contexts.

Deliverable 3.2a: Memo #1: Compare & contrast Work Areas 1 & 2

Due: 8 weeks after QAPP approval

Using the climate-smart adaptation cycle developed under the previous TO (0001) of this contract as a starting point, the Contractor shall prepare a memo of 4-8 pages that assesses progress across Work Areas 1 and 2. The memo shall compare-and-contrast the approaches, effectiveness, challenges, insights, conclusions and aspects unique to ecosystem-type under Work Area 1 and Work Area 2. Insofar as efforts under each Work Area have applied to various steps of adaptation planning, with the shared goal of informing practical management decisions on the ground, the memo will address where the approaches may have converged on conceptual grounds, and/or where they remain incongruent, and why.

Deliverable 3.2b: Annotated outline for journal article

Due: 4 weeks after 3.2a

approval

The Contractor shall use Memo #1 and comments received from the TOCOR as the basis to develop an annotated outline for a journal article. The outline should lay out the scope and major components of the paper, and the annotations should describe the main contents, including draft take-home messages.

Deliverable 3.2c: IRD journal article

Due: 8 weeks after 3.2b approval

The Contractor shall use the annotated outline of 3.2b as the starting point for working with the TOCOR to develop the first draft journal article.

Deliverable 3.2d: Memo #2: Feasibility of a larger-scale synthesis

Due: 31 July 2019 4 weeks after 3.2c approval

While the IRD journal article is undergoing internal review, the Contractor shall build on the ideas emerging from the journal article outline (Deliverable 3.2b), and the in-person team meeting of May 2019 to produce a second memo of 4-8 10-20 pages. This memo will assess the feasibility, and value and design of for engaging in a subsequent, larger-scale synthesis drawing from a greater number and variety of vulnerability and adaptation assessment efforts both within and outside of EPA. Using just a few example projects from the broader EPA EARG group as a starting point, the memo will speculate on the potential for being able to identify universal themes, common challenges, unique perspectives, and a consistent step-wise thought process for adaptation planning, which would be applicable to all systems and decision contexts. This shall include consideration of lessons learned not only across at least two aquatic ecosystems (e.g., wetlands, coral reefs, salmon habitat refugia), but will also provide comparison to other sectors such as coastal water quality/built infrastructure management (e.g., stormwater best management practices, flood control structures). Also included should be a proposed process for engaging with stakeholder/partners using the translational science framework of ORD (information will be provided by the TOCOR). This The memo is intended to form the basis for a proposal for future work, thus should also touch upon options for smaller-scope versus larger-scope versions.

Deliverable 3.2e: ERD and submission of journal article

Due: 4 weeks after receipt of IRD comments

The Contractor shall use TOCOR and EPA internal review comments to inform preparation of an ERD of the journal article in consultation with the TOCOR. The article will then be formatted and submitted to a journal selected in collaboration with the TOCOR and full project team.

Deliverable 3.2f: Revisions and final submission of journal article

Due: 4 weeks after receipt of external reviews

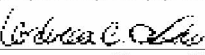
Working with feedback received from the external reviewers, the Contractor shall work with the TOCOR to revise the journal article and proceed with final submission for publication.

MILESTONES AND DELIVERABLES:

Task/ SubTask	Milestone/Deliverable	Due Date
1	Prepare Quality Assurance Project Plan and Establish/Maintain Communication	
1.1	Quality Assurance Project Plan	
	1.1a: Update Quality Assurance Project Plan	7 days after TO award
1.2	Communications	
	1.2a: Kickoff call and regular communications	7 days after QAPP approval
	1.2b: Progress reports	Monthly
2	National Wetlands Vulnerability Assessment Methods	
2.1	Journal article #1, Delaware Bay case study, Part I	
	2.1a: External Review Draft (ERD) and submission	Concurrent with submission of article #2 (see below)
	2.1b: Revisions and final submission	~4 weeks after receipt of external reviews (paired submission with article #2)
2.2	Journal article #2, Delaware Bay case study, Part II	
	2.2a: Internal Review Draft (IRD)	12 weeks after QAPP approval
	2.2b: ERD and submission	4 weeks after receipt of IRD comments (paired submission with article #1)
	2.2c: Revisions and final submission	~4 weeks after receipt of external reviews (paired submission with article #1)
3	Adaptation Planning Framework & Demonstrations	
3.1	Adaptation science collaborations	
	3.1a: Monthly calls	As needed, TBD with TOCOR
	3.1b: In-person working meetings	TBD with TOCOR
3.2	Synthetic principles and lessons learned	
	3.2a: Memo #1: Compare & contrast Work Areas 1 & 2	8 weeks after QAPP approval
	3.2b: Annotated outline for journal article	4 weeks after 3.2a approval
	3.2c: IRD journal article	8 weeks after 3.2b approval
	3.2d: Memo #2: Feasibility of a larger-scale synthesis	31 July 2019 4 weeks after 3.2e approval
	3.2e: ERD and submission of journal article	4 weeks after receipt of IRD comments
	3.2f: Revisions and final submission of journal article	4 weeks after receipt of external reviews

ACCEPTANCE CRITERIA:

The Contractor shall prepare high quality deliverables in accordance with academic standards. Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as jpeg or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format.

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE		PAGE OF PAGES	
				1		2	
2. AMENDMENT/MODIFICATION NO. P00002		3. EFFECTIVE DATE See Block 16C		4. REQUISITION/PURCHASE REQ. NO. PR-ORD-19-02298		5. PROJECT NO. (If applicable)	
6. ISSUED BY CAD US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: W136 Cincinnati OH 45268-0001		CODE CAD		7. ADMINISTERED BY (If other than Item 6)		CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) TETRA TECH, INC. Attn: George Townsend 10306 EATON PL STE 340 FAIRFAX VA 22030				(X) 9A. AMENDMENT OF SOLICITATION NO.			
				X 10A. MODIFICATION OF CONTRACT/ORDER NO. EP-C-17-031 68HE0C18F0894			
CODE 198549560		FACILITY CODE					
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS							
<input type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers <input type="checkbox"/> is extended. <input type="checkbox"/> is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or electronic communication which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by letter or electronic communication, provided each letter or electronic communication makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.							
12. ACCOUNTING AND APPROPRIATION DATA (If required) See Schedule							
13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.							
CHECK ONE	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.						
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation data, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).						
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:						
X	D. OTHER (Specify type of modification and authority) BILATERAL AGREEMENT - NO COST - POP EXTENSION PWS AMENDMENT						
E. IMPORTANT: Contractor <input type="checkbox"/> is not <input checked="" type="checkbox"/> is required to sign this document and return <u>1</u> copies to the issuing office.							
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)							
DUNS Number: 198549560							
TOCOR: Jordan West Max Expire Date: 03/31/2020							
LIST OF CHANGES:							
Reason for Modification: Other Administrative Action - BILATERAL AGREEMENT - NO COST - POP EXTENSION PWS AMENDMENT ATTACHED							
Period Of Performance End Date changed from 30-SEP-19 to 31-MAR-20							
Maximum Potential Expiration Date changed to : 03/31/2020							
CHANGES FOR LINE ITEM NUMBER: 1							
End Date changed from 30-SEP-19 to 31-MAR-20							
Continued ...							
Except as provided herein, all terms and conditions of the document referenced in Item 9 A or 10A, as heretofore changed, remains unchanged and in full force and effect.							
15A. NAME AND TITLE OF SIGNER (Type or print)				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)			
				Andrea Dehne			
15B. CONTRACTOR/OFFEROR		15C. DATE SIGNED		16B. UNITED STATES OF AMERICA		16C. DATE SIGNED	
(Signature of person authorized to sign)				 (Signature of Contracting Officer)		ELECTRONIC SIGNATURE 09/19/2019	

CONTINUATION SHEET	REFERENCE NO. OF DOCUMENT BEING CONTINUED	PAGE	OF
	EP-C-17-031/68HE0C18F0894/P00002	2	2

NAME OF OFFEROR OR CONTRACTOR
TETRA TECH, INC.

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	<p>Period of Performance: 10/01/2018 to 03/31/2020</p> <p>Delivery-Invoice Payment Schedule shall not exceed a frequency greater than once a month and 90% of the task order price. Acceptance for invoicing is based on deliverable approval by the TOCOR. For efficient processing IAW FAR clause 52.232-32, performance based payment invoicing amounts will not be submitted until the TOCOR provides deliverable approval. The TOCOR will notify Tetra Tech within 14 days of submission of a deliverable of EPAs intention to approve or disapprove.</p> <p>TOCOR: Jordan West/703-347-8584/west.jordan@epa.gov ALTOCOR: Susan Julius/703-347-8619/julius.susan@epa.gov</p>				

PERFORMANCE WORK STATEMENT

Amendment 2

Contract: EP-C-17-031
PR-ORD-19-02298
TO 18F0894

TITLE: Adaptation Planning for Resilient Natural Resources

EAS Short Title: Adaptation for Natural Resources

PERIOD OF PERFORMANCE: 10/01/18-3/31/20 (6 months' extension, no cost)

TASK ORDER COR: Jordan West
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INTRODUCTION

Work in EPA's Exposure Analysis and Risk Characterization Group (EARCG) includes assessments of the potential vulnerability to climate change (and other global change stressors such as land-use change) of ecosystem health, water quality, human health and air quality with a focus on developing adaptation options to build resilience in the face of these vulnerabilities. We carry out interdisciplinary syntheses across newly emerging scientific findings to identify potential impacts and characterize and communicate the uncertainty in the science and to provide adaptation support for decision makers and managers. Vulnerability and adaptation assessment activities in the EARCG's aquatic ecosystems focus area support EPA's mission and responsibilities as defined by the Clean Water Act (CWA) and are designed to build the capacity of EPA programs, regional offices, aquatic ecosystem managers (including wetland and coral reef managers), and other decision-makers to assess and respond to global change impacts on ecosystem processes and services. The purpose of this task order is to provide technical support to the EARCG and partners to advance frameworks and methods for vulnerability assessments and adaptation planning processes for resilient wetland, coral reef, and other natural resource systems.

This task order (TO) focuses on two complementary areas of work: (1) vulnerability and adaptation assessment methods for wetlands and their applications for resilience-based management; and (2) adaptation planning frameworks demonstrated for coral reefs and other aquatic systems. Each of these major areas of work is represented by a Task.

Work Area 1, **National Wetlands Vulnerability Assessment Methods**, supports EPA Office of Water's (OW) priority #4 (Watersheds at risk) and priority #5 (Coastal wetlands at risk). Earlier work in this area focused on: the development of a methodological framework and inventory of wetland vulnerabilities for a mid-Atlantic pilot region based on vulnerability assessment methods, resilience theory, and wetlands classifications; an analysis and summary of best approaches for applying inventory results to inform adaptation of EPA OW Programs; and initiation of follow-on work in the form of a Coastal Track (extending the framework and approach to coastal wetlands) and a Programmatic Track (applying the framework and results to decision-making with partners in State programs). An EPA report and two journal articles initiated under the Coastal Track and are underway in collaboration with stakeholders from the Partnership for the Delaware Estuary (PDE).

Work Area 2, **Adaptation Planning Framework & Coral Reef Demonstration**, supports EPA OW'S priority #8 (Indicators of climate change), as well as needs of EPA Regions with coral reefs and other applicable aquatic systems (such as those supported by the Chesapeake Bay Program). Earlier work in this area focused on: collaboration with a Climate-Smart Work Group convened by the National Wildlife Federation to develop a unified adaptation framework for natural resources; demonstration of a more detailed and tailored use of the framework for coral reef ecosystems to assist practitioner-managers in the field; and development of an "Adaptation Design Tool" that helps scientists and managers brainstorm and design effective adaptation actions in response to identified vulnerabilities to the resilience of their natural resources due to environmental change. Collaborations are underway with The Nature Conservancy (TNC) and the National Oceanic and Atmospheric Administration (NOAA) to advance the use of the Adaptation Design Tool across U.S. coral reef jurisdictions.

OBJECTIVES

For **Work Area 1**, the Contractor shall continue—following on work under the previous Task Order (0001) of this contract--technical advancement of frameworks and methods for characterizing wetland relative vulnerabilities for multiple wetland types at multiple scales, to support development of information and processes for integrating climate change considerations into wetlands programs and activities of OW as well as Regional and State partners. Objectives are to:

- (1) Finalize and publish journal article #1, *Framework for assessing wetland vulnerabilities to sea level rise in order to inform management: Delaware Bay case study, Part I*. This covers the technical approach for extending framework concepts to coastal wetlands using previously-generated SLAMM (Sea Level Affecting Marshes Model) projections, followed by application of the results to examine implications for wetlands restoration and management.
- (2) Develop and publish journal article #2, *Integrating storm surge and marsh condition along with sea level rise into coastal wetland vulnerability assessments: Delaware Bay case study, Part II*. This covers the technical approach for inclusion of projected storm surge impacts and condition assessment data when using the relative vulnerabilities framework, to better understand, characterize and communicate both vulnerabilities and potential management responses.

For **Work Area 2**, the Contractor shall provide technical support-- following on work under the previous Task Order (0001) of this contract --for continued elaboration of the climate-smart adaptation planning

cycle, with development of associated adaptation design and evaluation methods. Objectives are to:

- (1) Work with outside partners to develop collaborations to demonstrate, ground-truth and promulgate adaptation design and evaluation methods with practitioners in the field engaged in resilience-based management.
- (2) Develop and publish a journal article on lessons learned and synthetic principles that emerge from comparing and contrasting frameworks and methods under Work Area 1 and Work Area 2, in terms of their convergence on questions of how to move smoothly from vulnerability assessment, to adaptation design, to adaptation assessment (evaluation and selection of best practices), to implementation; also included will be a feasibility analysis of the potential value of pursuing a larger-scale synthesis of diverse adaptation projects across ORD and beyond, to identify universal themes, common challenges, unique perspectives, and the potential for a unifying framework or consistent step-wise thought process applicable to all systems and decision contexts.

REQUIRED CONTRACTOR QUALIFICATIONS

- 1) Multidisciplinary professional expertise in assessing the impacts of climate change and other interacting stressors (such as land use change) on climate-sensitive ecosystems, including expertise in resilience and threshold theory and management adaptation.
- 2) Thorough knowledge and application of wetlands classification systems including the hydro-geomorphic method (HGM) and Cowardin/National Wetlands Inventory (NWI) system; thorough knowledge of the CWA Section 404 compensatory mitigation program; and familiarity with State voluntary restoration activities in EPA Region 3.
- 3) Thorough knowledge of conceptual approaches, methods, trainings and on-the-ground work on climate change vulnerability assessment and adaptation planning applications for coral reef, wetland, and watershed conservation and management.
- 4) Experience developing and evaluating practical frameworks and trainings for integrating climate change considerations into management planning and building resilience into conservation.
- 5) Expertise in directed literature searches and synthetic analyses of available literature (including grey literature). Expertise in conducting literature reviews and compiling, interpreting and using pertinent models, data sets and reports for wetlands associated with Coastal Track and Programmatic Track case study locations.
- 6) Experience organizing and facilitating stakeholder processes, partnerships, and expert scientific meetings.
- 7) Experience developing, managing, and ensuring quality control of large-scale datasets and assessments.
- 8) Experience preparing technical reports and papers written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

SPECIFIC TASKS:**TASK 1 Prepare Quality Assurance Project Plan and Establish/Maintain Communication****SubTask 1.1: Develop a Quality Assurance Project Plan**

For previous work under TO 0001 of this contract, the Contractor has been working under Quality Assurance Project Plan (QAPP) #494, which documents the quality processes and procedures for the types of tasks associated with this project. The Contractor shall create an updated QAPP for this Task Order, adding any new information as necessary to reflect the Tasks below, and shall submit the QAPP for TOCOR and QA Manager's approval. The Contractor shall not perform any work on the new tasks under this task order until the QAPP is reviewed and approved by the TOCOR and QA Manager. The QAPP shall include documentation on quality assurance checks to verify accuracy, completeness, and adherence to established format and must address data collection, analysis, and the use of existing (secondary) data that will be used in this project. Guidance for developing QAPPs that meet EPA specifications prepared for activities conducted by or funded by EPA, are available online at http://www.epa.gov/quality/qa_docs.html, see "EPA Requirements for Quality Assurance Project Plans (QA/R-5)". EPA ORD has a new requirement and new tracking system. The contractor shall include the following EPA ORD QA Tracking number on the QAPP cover page: X-XX-XXXXXXX-XX-X-X.

Deliverable 1.1a: QAPP**Due:** within 7 days of task order award

The Contractor shall not proceed with Tasks 2 - 3 until the QAPP is approved.

SubTask 1.2: Establish and Maintain Communication

Within seven days after QAPP approval, the Contractor shall schedule a kickoff call, not to exceed 2 hours, with the TOCOR and appropriate Contractor staff to clarify outstanding questions and confirm the schedule and specific tasks. The Contractor shall establish a schedule for regular progress reports, check in calls, and other communications throughout the period of performance. The Contractor shall initiate additional communication with the TOCOR should developments arise that may affect the conduct or schedule of any task. The Contractor shall prepare very brief minutes of meetings with the EPA staff and monthly status reports. The EPA will review the minutes to ensure that an accurate record of the communications has been made and filed.

Deliverable 1.2a: Kickoff call**Due:** within 7 days of QAPP approval**Deliverable 1.2b:** Regular status reports**Due:** monthly

TASK 2 National Wetlands Vulnerability Assessment Methods**SubTask 2.1: Journal article #1, Delaware Bay case study, Part I**

Under a previous TO (0001) of this contract, EPA and the Contractor collaborated with the Partnership

for the Delaware Estuary (PDE) on a case study that uses a modified coastal wetlands vulnerability framework to assess the relative vulnerabilities of salt marshes of the Delaware Estuary in order to inform adaptation of PDE programs. The Contractor shall continue working from the existing vulnerability assessment and adaptation analysis for the specific case study application. The TOCOR will provide a draft journal article that has already been developed on this case study, along with internal review comments, as the starting point for this SubTask.

In this SubTask, the Contractor shall work with the TOCOR to finalize and submit the abovementioned journal article, *Framework for assessing wetland vulnerabilities to sea level rise in order to inform management: Delaware Bay case study, Part I*. This presents the technical approach for application of framework concepts to coastal wetlands in the Delaware Estuary—including discussion of approaches for both data-rich and data-scarce situations—and the framework’s applicability at the national scale. The journal article will examine a subset of this information as it relates to selected management targets and development of recommendations for management adaptations within PDE wetlands conservation and restoration programs. Based on the results of EPA internal review and clearance of the internal review draft (IRD), the Contractor shall produce and submit an external review draft (ERD) for journal review, followed by revision and final submission of the finished product for publication based on external review comments. All product versions will be written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

Deliverable 2.1a: External Review Draft (ERD) and submission **Due:** Concurrent with submission of article #2 (see below)

The Contractor shall use the materials provided by the TOCOR (draft journal article with EPA internal review comments) to prepare an ERD journal article in consultation with the TOCOR. The article will then be formatted and submitted to a journal selected in collaboration with the TOCOR and full project team. The goal will be to submit article #1 and article #2 to the same journal as a pair (Part I and Part II); therefore, the submission date for this ERD will be determined by readiness to submit article #2.

Deliverable 2.1b: Revisions and final submission **Due:** ~4 weeks after receipt of external review comments (paired with article #2)

Working with feedback received from the external reviewers, the Contractor shall work with the TOCOR to revise the journal article and proceed with final submission for publication. Since the goal will be to publish article #1 and article #2 in the same journal simultaneously, the timeline for final submission may need to be adjusted based on timing of receipt of reviews of both articles, and as per instruction from the TOCOR.

SubTask 2.2: Journal article #2, Delaware Bay case study, Part II

Under a previous TO (0001) of this contract, EPA and the Contractor began discussions and an outline for a follow-on journal article to article #1 above. The Contractor shall continue working from this draft outline to develop and submit a second article for publication. The TOCOR will provide the annotated draft outline, along with comments, as a starting point for this journal article.

Therefore, in this SubTask the Contractor shall work with the TOCOR to develop, submit for internal review, revise, submit for journal review, and make final revisions for publication of the journal article,

Integrating storm surge and marsh condition along with sea level rise into coastal wetland vulnerability assessments: Delaware Bay case study, Part II. This article will present the technical approach for inclusion of projected storm surge impacts and condition assessment data in combination with outputs of the relative vulnerabilities framework (presented in journal article #1; this complementary information, examined in conjunction with framework results, will be used to better understand, characterize and communicate both vulnerabilities and potential management responses for the PDE case study wetlands. An internal review draft will first be developed, and based on results of the EPA internal review and clearance process, the Contractor shall produce and submit an external review draft (ERD) for journal review, followed by revision and final submission of the finished product for publication based on external review comments. All product versions will be written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

Deliverable 2.2a: Internal Review Draft (IRD)

Due: 12 weeks after QAPP approval

The Contractor shall use the annotated outline provided by the TOCOR as the starting point for working with the TOCOR to develop the first draft journal article. This should include first finalizing the outline—based on TOCOR comments as well as team review of the finalized content of article #1—to clarify article #2’s scope, substance and continuity with article #1.

Deliverable 2.2b: External Review Draft (ERD) and submission

Due: 4 weeks after receipt of IRD comments (paired submission with article #1)

The Contractor shall use TOCOR and EPA internal review comments to inform preparation of an ERD of the journal article in consultation with the TOCOR. The article will then be formatted and submitted to a journal selected in collaboration with the TOCOR and full project team. The goal will be to submit article #2 along with article #1 to the same journal as a pair (Part I and Part II); therefore, the submission date for both articles will be determined by readiness to submit article #2.

Deliverable 2.2c: Revisions and final submission

Due: ~4 weeks after receipt of external review comments (paired submission with article #1)

Working with feedback received from the external reviewers, the Contractor shall work with the TOCOR to revise the journal article and proceed with final submission for publication. Since the goal will be to publish article #1 and article #2 in the same journal simultaneously, the timeline for final submission may need to be adjusted based on timing of receipt of reviews of both articles, and as per instruction from the TOCOR.

TASK 3 Adaptation Planning Framework & Coral Reef Demonstration

SubTask 3.1: Adaptation science collaborations

In this SubTask, the Contractor shall work with the TOCOR to build collaborative partnerships to demonstrate, ground-truth and promulgate adaptation design and evaluation methods with practitioners in the field engaged in resilience-based management. This may include, but is not limited

to, technical advice and support for: use of the Adaptation Design Tool developed in the previous TO (0001); development of projects to further advance methods for moving from design, to evaluation and selection of priority actions, to development of tools, worksheets and methods to assist practitioners in applying adaptation design principles. It shall also involve travel by Contractor staff to two in-person working meetings to develop collaborative processes and technical outputs.

Deliverable 3.1a: Monthly calls

Due: As needed, TBD with TOCOR

The Contractor shall participate in brainstorming calls with partners approximately monthly as needed, as determined in consultation with the TOCOR.

Deliverable 3.1b: In-person working meetings

Due: TBD with TOCOR

Contractor staff shall attend two in-person meetings of two days each, to work with EPA project team members and external partners in the Washington, DC area. Travel and lodging arrangements shall be consistent with U.S. government travel, lodging, and per diem allowances. The Contractor shall budget for two staff members familiar with the wetlands and climate-smart adaptation framework areas of work to attend one of the meetings, and one staff member familiar with the coral reef/adaptation design tool work to attend the other meeting. The Contractor shall assist the TOCOR in producing an agenda and presentation for each meeting, shall then travel to and attend at the meetings, and shall submit meeting notes after the meetings.

SubTask 3.2: Synthetic principles and lessons learned

In this SubTask, the Contractor shall work with the TOCOR to develop and publish a journal article on lessons learned and synthetic principles that emerge from comparing and contrasting frameworks and methods under Work Area 1 and Work Area 2. An initial assessment will be made of the work areas' convergence on questions of how to move smoothly from vulnerability assessment, to adaptation design, to adaptation assessment (evaluation and selection of best practices), to implementation; the topics developed will be used as the basis for scoping and developing a journal article. As the journal article progresses, there will be a concomitant exercise to assess the feasibility and potential value of pursuing a larger-scale synthesis of diverse adaptation projects across ORD and beyond, to identify universal themes, common challenges, unique perspectives, and the potential for a unifying framework or consistent step-wise thought process applicable to all systems and decision contexts.

Deliverable 3.2a: Memo #1: Compare & contrast Work Areas 1 & 2

Due: 8 weeks after QAPP approval

Using the climate-smart adaptation cycle developed under the previous TO (0001) of this contract as a starting point, the Contractor shall prepare a memo of 4-8 pages that assesses progress across Work Areas 1 and 2. The memo shall compare-and-contrast the approaches, effectiveness, challenges, insights, conclusions and aspects unique to ecosystem-type under Work Area 1 and Work Area 2. Insofar as efforts under each Work Area have applied to various steps of adaptation planning, with the shared goal of informing practical management decisions on the ground, the memo will address where the approaches may have converged on conceptual grounds, and/or where they remain incongruent, and why.

Deliverable 3.2b: Annotated outline for journal article

Due: 4 weeks after 3.2a

approval

The Contractor shall use Memo #1 and comments received from the TOCOR as the basis to develop an annotated outline for a journal article. The outline should lay out the scope and major components of the paper, and the annotations should describe the main contents, including draft take-home messages.

Deliverable 3.2c: IRD journal article

Due: 8 weeks after 3.2b approval

The Contractor shall use the annotated outline of 3.2b as the starting point for working with the TOCOR to develop the first draft journal article.

Deliverable 3.2d: Memo #2: Feasibility of a larger-scale synthesis

Due: 31 July 2019 4 weeks after 3.2c approval

While the IRD journal article is undergoing internal review, the Contractor shall build on the ideas emerging from the journal article outline (Deliverable 3.2b), and the in-person team meeting of May 2019 to produce a second memo of 4-8 10-20 pages. This memo will assess the feasibility, and value and design of for engaging in a subsequent, larger-scale synthesis drawing from a greater number and variety of vulnerability and adaptation assessment efforts both within and outside of EPA. Using just a few example projects from the broader EPA EARCG group as a starting point, the memo will speculate on the potential for being able to identify universal themes, common challenges, unique perspectives, and a consistent step-wise thought process for adaptation planning, which would be applicable to all systems and decision contexts. This shall include consideration of lessons learned not only across at least two aquatic ecosystems (e.g., wetlands, coral reefs, salmon habitat refugia), but will also provide comparison to other sectors such as coastal water quality/built infrastructure management (e.g., stormwater best management practices, flood control structures). Also included should be a proposed process for engaging with stakeholder/partners using the translational science framework of ORD (information will be provided by the TOCOR). ~~This~~ The memo is intended to form the basis for a proposal for future work, thus should also touch upon options for smaller-scope versus larger-scope versions.

Deliverable 3.2e: ERD and submission of journal article

Due: 4 weeks after receipt of IRD comments

The Contractor shall use TOCOR and EPA internal review comments to inform preparation of an ERD of the journal article in consultation with the TOCOR. The article will then be formatted and submitted to a journal selected in collaboration with the TOCOR and full project team.

Deliverable 3.2f: Revisions and final submission of journal article

Due: 4 weeks after receipt of external reviews

Working with feedback received from the external reviewers, the Contractor shall work with the TOCOR to revise the journal article and proceed with final submission for publication.

MILESTONES AND DELIVERABLES:

Task/ SubTask	Milestone/Deliverable	Due Date
1	Prepare Quality Assurance Project Plan and Establish/Maintain Communication	
1.1	Quality Assurance Project Plan	
	1.1a: Update Quality Assurance Project Plan	7 days after TO award
1.2	Communications	
	1.2a: Kickoff call and regular communications	7 days after QAPP approval
	1.2b: Progress reports	Monthly
2	National Wetlands Vulnerability Assessment Methods	
2.1	Journal article #1, Delaware Bay case study, Part I	
	2.1a: External Review Draft (ERD) and submission	Concurrent with submission of article #2 (see below)
	2.1b: Revisions and final submission	~4 weeks after receipt of external reviews (paired submission with article #2)
2.2	Journal article #2, Delaware Bay case study, Part II	
	2.2a: Internal Review Draft (IRD)	12 weeks after QAPP approval
	2.2b: ERD and submission	4 weeks after receipt of IRD comments (paired submission with article #1)
	2.2c: Revisions and final submission	~4 weeks after receipt of external reviews (paired submission with article #1)
3	Adaptation Planning Framework & Demonstrations	
3.1	Adaptation science collaborations	
	3.1a: Monthly calls	As needed, TBD with TOCOR
	3.1b: In-person working meetings	TBD with TOCOR
3.2	Synthetic principles and lessons learned	
	3.2a: Memo #1: Compare & contrast Work Areas 1 & 2	8 weeks after QAPP approval
	3.2b: Annotated outline for journal article	4 weeks after 3.2a approval
	3.2c: IRD journal article	8 weeks after 3.2b approval
	3.2d: Memo #2: Feasibility of a larger-scale synthesis	31 July 20194 weeks after 3.2c approval
	3.2e: ERD and submission of journal article	4 weeks after receipt of IRD comments
	3.2f: Revisions and final submission of journal article	4 weeks after receipt of external reviews

ACCEPTANCE CRITERIA:

The Contractor shall prepare high quality deliverables in accordance with academic standards. Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as jpeg or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format.

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT			1. CONTRACT ID CODE		PAGE OF PAGES 1 2										
2. AMENDMENT/MODIFICATION NO. P00003		3. EFFECTIVE DATE See Block 16C		4. REQUISITION/PURCHASE REQ. NO. PR-ORD-20-01387		5. PROJECT NO. (If applicable)									
6. ISSUED BY CAD US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: W136 Cincinnati OH 45268-0001		CODE CAD		7. ADMINISTERED BY (If other than Item 6)		CODE									
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) TETRA TECH, INC. Attn: George Townsend 10306 EATON PL STE 340 FAIRFAX VA 22030				(x)			9A. AMENDMENT OF SOLICITATION NO.								
							9B. DATED (SEE ITEM 11)								
				x			10A. MODIFICATION OF CONTRACT/ORDER NO. EP-C-17-031 68HE0C18F0894								
							10B. DATED (SEE ITEM 13) 09/25/2018								
CODE 198549560		FACILITY CODE													
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS															
<input type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers <input type="checkbox"/> is extended. <input type="checkbox"/> is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or electronic communication which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by letter or electronic communication, provided each letter or electronic communication makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.															
12. ACCOUNTING AND APPROPRIATION DATA (If required) See Schedule															
13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.															
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">CHECK ONE</td> <td>A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.</td> </tr> <tr> <td></td> <td>B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation data, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).</td> </tr> <tr> <td></td> <td>C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:</td> </tr> <tr> <td style="text-align: center;">X</td> <td>D. OTHER (Specify type of modification and authority) BILATERAL AGREEMENT - CONFIRM DELIVERABLE RECEIPT IN FULL FOR TASK ORDER CLOSEOUT</td> </tr> </table>								CHECK ONE	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.		B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation data, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).		C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:	X	D. OTHER (Specify type of modification and authority) BILATERAL AGREEMENT - CONFIRM DELIVERABLE RECEIPT IN FULL FOR TASK ORDER CLOSEOUT
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E. IMPORTANT: Contractor <input type="checkbox"/> is not <input checked="" type="checkbox"/> is required to sign this document and return <u>1</u> copies to the issuing office.															
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) DUNS Number: 198549560 TOCOR: Jordan West Max Expire Date: 03/31/2020 LIST OF CHANGES: Reason for Modification: Confirm Closeout															
Period of Performance: 10/01/2018 to 03/31/2020 Delivery-Invoice Payment Schedule shall not exceed a frequency greater than once a month and 90% of the task order price. Acceptance for invoicing is based on deliverable approval by the TOCOR. For efficient processing IAW FAR clause 52.232-32, performance based payment Continued ...															
Except as provided herein, all terms and conditions of the document referenced in Item 9 A or 10A, as heretofore changed, remains unchanged and in full force and effect.															
15A. NAME AND TITLE OF SIGNER (Type or print)				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)											
				Andrea Dehne											
15B. CONTRACTOR/OFFEROR		15C. DATE SIGNED		16B. UNITED STATES OF AMERICA		16C. DATE SIGNED									
_____ (Signature of person authorized to sign)				 (Signature of Contracting Officer)		ELECTRONIC SIGNATURE 07/24/2020									

CONTINUATION SHEET	REFERENCE NO. OF DOCUMENT BEING CONTINUED	PAGE	OF
	EP-C-17-031/68HE0C18F0894/P00003	2	2

NAME OF OFFEROR OR CONTRACTOR
TETRA TECH, INC.

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	invoicing amounts will not be submitted until the TOCOR provides deliverable approval. The TOCOR will notify Tetra Tech within 14 days of submission of a deliverable of EPAs intention to approve or disapprove. TOCOR: Jordan West/703-347-8584/west.jordan@epa.gov ALTOCOR: Susan Julius/703-347-8619/julius.susan@epa.gov				